

Art of Infinity



Kenneth Brecher

Departments of Astronomy and Physics

Boston University

Boston, MA 02215, U.S.A.

E-mail: brecher@bu.edu

Introduction

Mathematicians, scientists, philosophers (and, yes theologians!) have explored ideas of infinity for as long as there have been records of human activity.

Infinity has also been the subject of paintings, sculptures and other visual art forms in many cultures for at least as long a time.

In some ways artists have embraced infinity even more than mathematicians and scientists. For example, regarding Einstein's aversion to the reality of infinity in science, Sir Arthur Stanley Eddington wrote in his book *Pathways in Science*: "That queer quantity 'infinity' is the very mischief, and no rational physicist should have anything to do with it. Perhaps that is why mathematicians represent it by a sign like a love knot."

Preliminaries

“I could be bounded in a nutshell and count myself a king of infinite space.” - Hamlet

“If, like Hamlet, you count yourself king of an infinite space, I do not challenge your sovereignty. I only invite attention to certain disquieting rumors which have arisen as to the state of Your Majesty's Nutshell.” - Sir Arthur Stanley Eddington

A number of modern creations that combine artistic, mathematical and/or scientific ideas of infinity will be presented here.

Two sculptures in this genre designed by the author and his collaborator Randy Rhine will also be presented.

I will begin with a few remarks about the origins of some of the many visual representations of infinity in order to set the stage for how they have evolved in more recent artistic expressions of the subject.

I will also take some time to examine eternity.

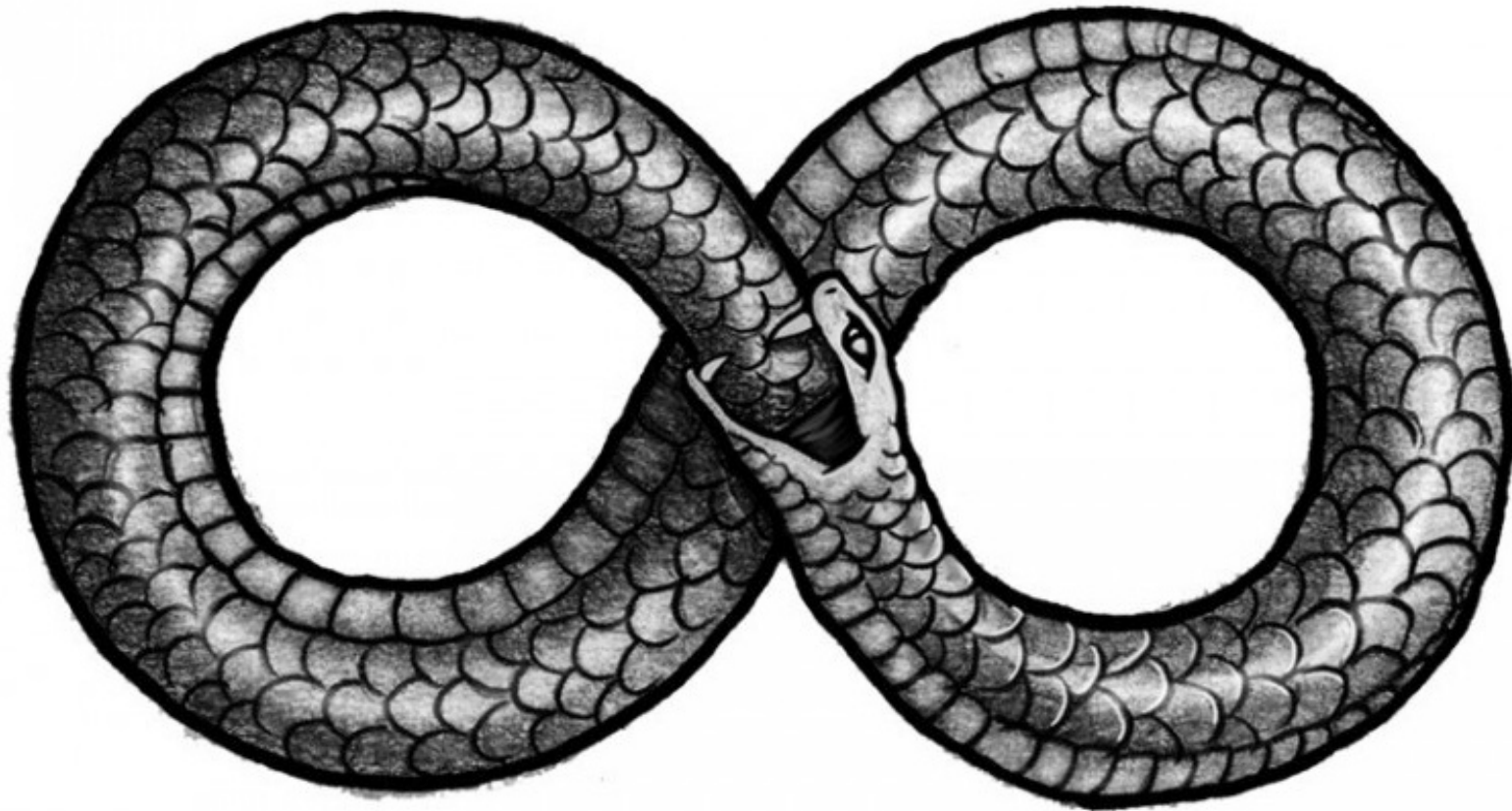
Possible Origins of Some Visual Representations of the Infinite

English mathematician John Wallis is credited with proposing the mathematical symbol for infinity (essentially the number 8 on its side) in 1655, though the image itself dates back at least two millennia.



Roman Mosaic (Stara Zagora, Bulgaria), 100 AD

Sometimes the image of the snake (or worm) Ouroboros swallowing its own tail plays a related role concerning eternity.

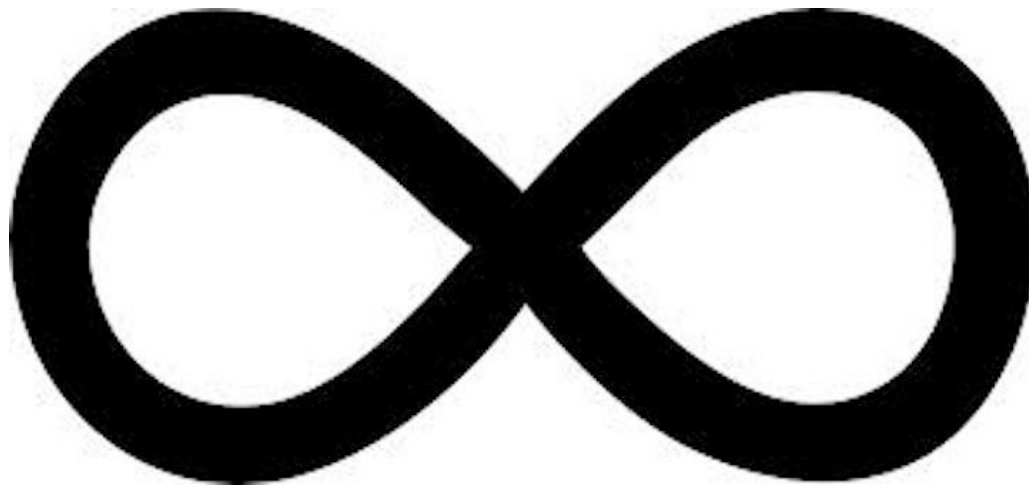


Unknown, “Ouroboros Dragon”

The early use of the sideways 8 symbol to represent the infinite may be one of the reasons why the Möbius band, whose 2D projection has a similar appearance, also came to be a symbol of the infinite.



Or did the lemniscate play a major role? Or the “Love Knot”? Or?



Art of The Mobius Band

The Möbius band (also called the Möbius strip) was discovered/invented/devised in 1858 almost simultaneously by two German mathematicians: August Ferdinand Möbius and Johann Benedict Listing. Though Listing (who coined the word “topology”) found it first, history has given the credit to Möbius.

With its continuous single edge and single surface, it is often used to symbolize concepts of infinity. It seems ironic that this is the case, given that Listing’s PhD advisor, Carl Friedrich Gauss, had expressed doubt about the legitimacy of the very concept of infinity then prevailing within mathematics (“horror of the actual infinitude”). In 1831 Gauss wrote “I protest against the use of infinite magnitude...Infinity is merely a way of speaking...” And then there came along Dedekind, Cantor, Gödel and others.

Many sculptors have created variations on the Möbius band in their own explorations of the infinite. As a sculptor, Swiss artist Max Bill is possibly best known for his many sculptures based on the shape. He has said that he discovered the Möbius band for himself in 1935.



Max Bill, “Endless Ribbon”, bronze, 1953

Charles O. Perry's most visited sculpture, "Continuum", sits in front of the Air and Space Museum in Washington, DC. About it he wrote: "Continuum began as an exploration of the Möbius strip...The center of the bronze sculpture symbolizes a black hole, while the edge shows the flow of matter through the center from positive to negative space and back again in a continuum." Question: Möbius band or knot?



Charles O. Perry, "Continuum", bronze, painted black, 1976

Sculptors of Infinity: J. Safer, R. X. Zawitz, & E. D. Herschler

Other sculptors have explored infinity using very different topological forms. John Safer did three sculptures all entitled “Limits of Infinity”. Version III is at George Washington University, though it is currently enshrouded in a wooden box, ironically making its name a reality!



John Safer, “Limits of Infinity III”, brass, 1979

In 1975, American artist/sculptor/designer Richard X. Zawitz, created an object he called the “Tangle”. He has made it in many forms, from 1’ adjustable plastic objects, to 16’ tall stainless steel sculptures.

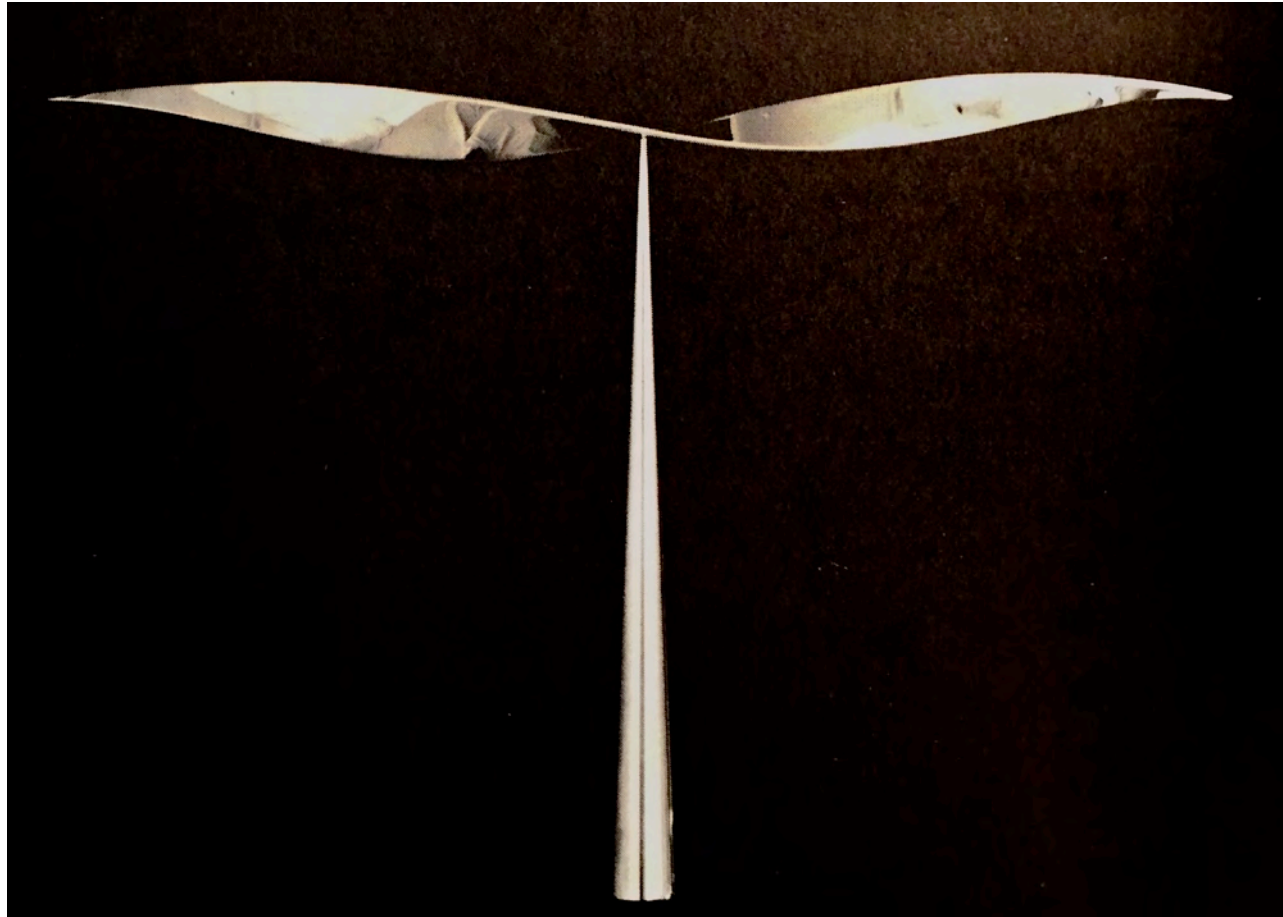


Richard X. Zawitz, “Infinite Man”, stainless steel, 2012(l); RXZ & KB (r)

Zawitz says, "Infinity is not some grand mathematical formula that can fill up rooms of information. Infinity is we, the human species residing on planet earth. Only we humans can conceive of such a vast concept". Given the current fascination in the particle physics community with strings to represent the ultimate nature of all matter, he would like to see his "Tangle" replace the Möbius band as the visual symbol of infinity. Nobel campaign or quixotic quest?



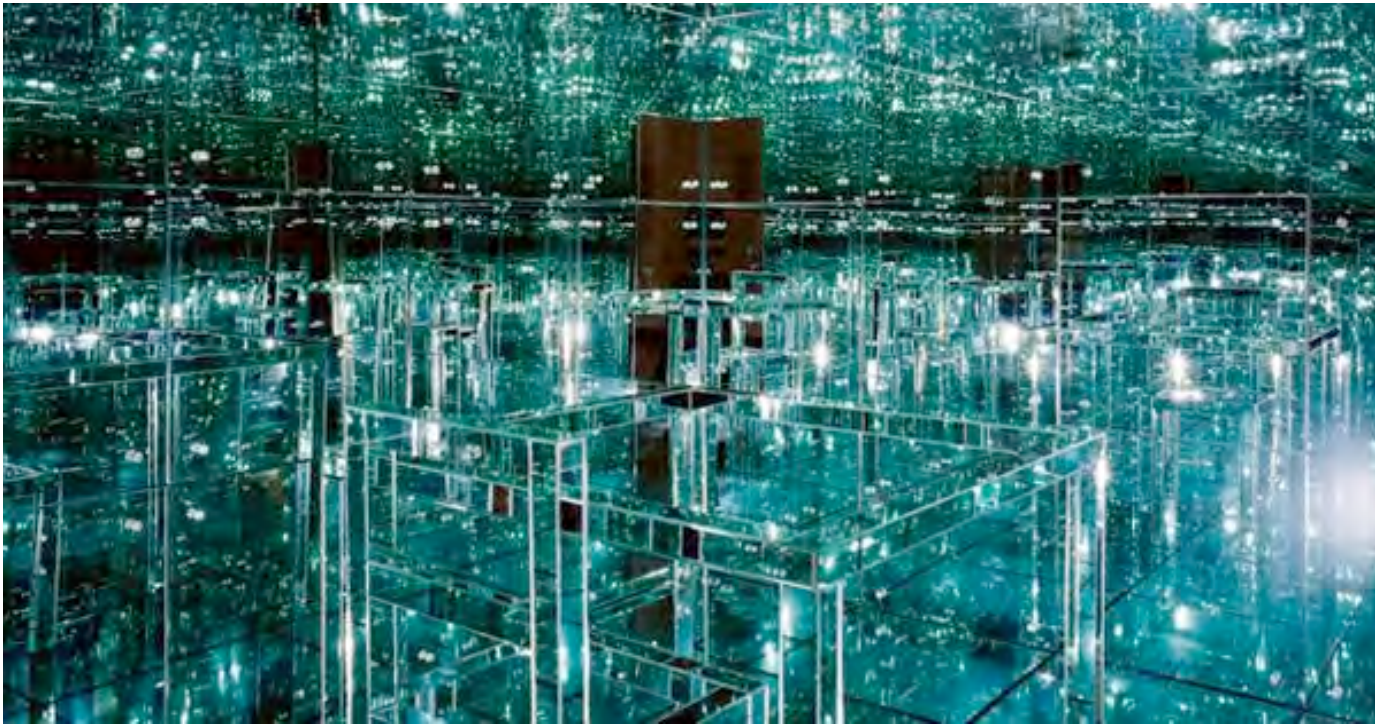
American sculptor Elijah David Herschler developed a body of work he called “Ribbons in Space”. He described them as “...a catalyst for the transformation of consciousness, bringing one in touch with the source of being...our universality, our infiniteness.”



Elijah David Herschler, “Infinity”, polished stainless steel, 1973

Mirroring Infinity

Several artists have employed parallel mirrors in their art. Perhaps the first to do this was the American artist Lucas Samaras. Upon entering his 1966 “Mirrored Room” at the Albright-Knox Art Gallery in Buffalo, New York one feels a dizzying sense of dislocation in space. The Japanese artist Yayoi Kusama has created similar rooms.



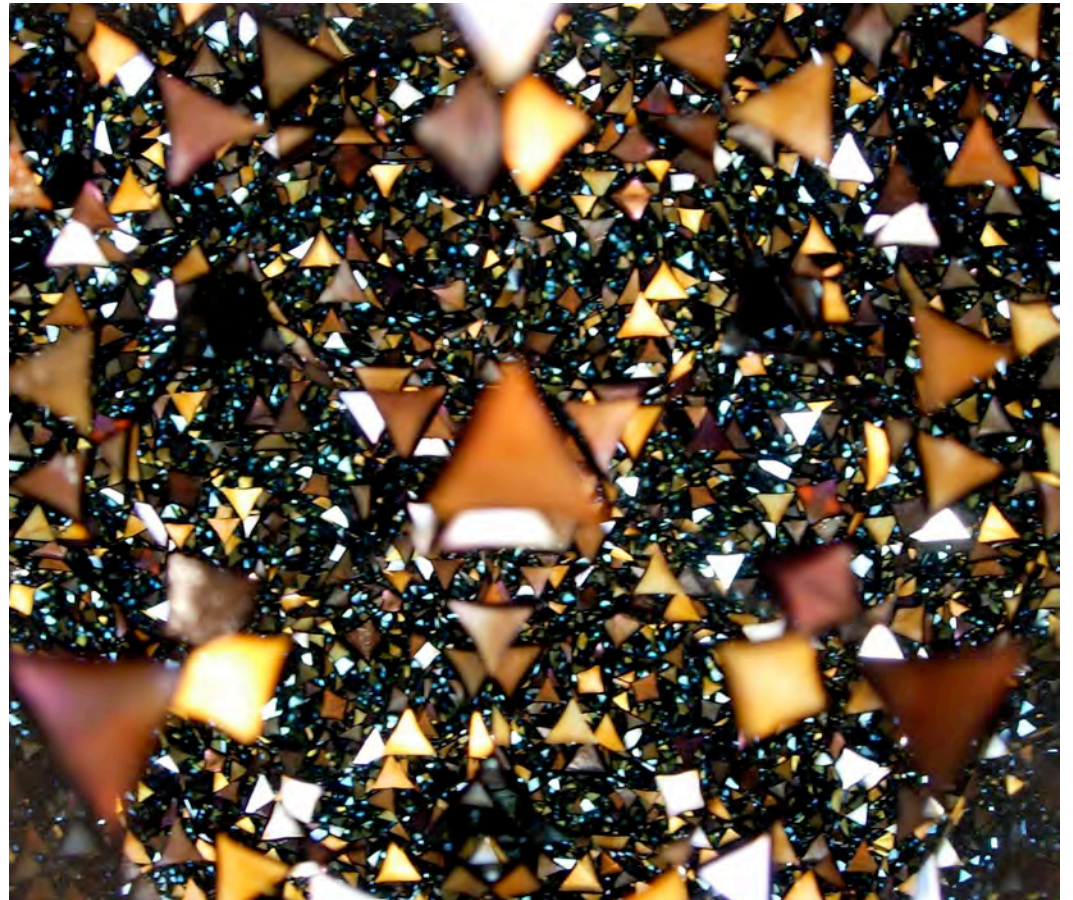
Lucas Samaras, “Mirrored Room”, 1966

Possibly the most marvelous variation on this theme was created by American glass artist and MacArthur (“genius”) Fellow Josiah McElheny. Some of his works use a half-silvered mirror facing the viewer and a reflecting mirror on the opposite surface of a space in which an array of aluminized glass objects seem to stretch to infinity.



Josiah McElheny, “Mirrored and Reflected Infinity”, 2004

The invention of the kaleidoscope in 1816 by Sir David Brewster initiated the exploration of angled mirror devices. American artist Gary Alison has created versions of what he calls “holoscopes” that employ many geometrical shapes, including all of the Platonic solids. Images are created by light entering from the vertices of the mirrors.



G. Alison, “Cosmos” exterior (l), interior (r), stained glass and mirrors, 2010

“Cumos” cubes were devised by Japanese artist Minori Yamazaki. His name “Cumos” comes from the combination of cosmos and cube and represents his attempt to combine the “mystery of the finite and the infinite” by placing the “universe in a box”. Seen through a single opening, the seemingly infinite array of objects arises from the painted images on the mirror walls.

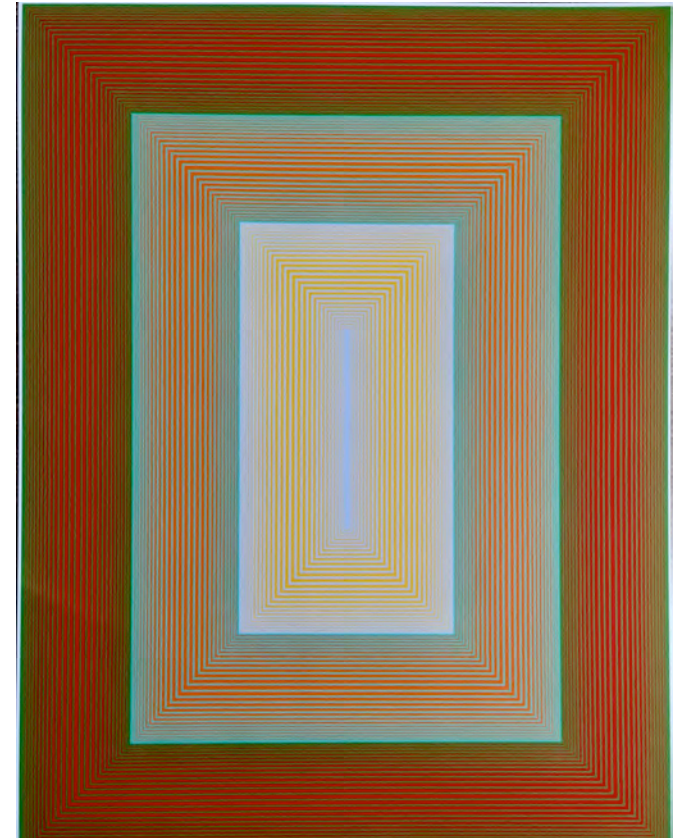


M. Yamazaki, “Cumos Cube” interior & exterior, plastic box with 6 mirror walls, 1985

William Blake and **Richard Anuszkiewicz**

**Many poets have explored ideas of infinity and eternity. The visionary artist-poet William Blake (1757 - 1827) is singular among them by having had the artistic and literary temperament, interest and ability to explore the possibilities of unending space and time in multiple media and literary works. In his portrayal of Sir Isaac Newton, Blake shows Newton concentrating on a mathematical construction, with his back to a seemingly chaotic material world. As the inventor of the calculus, Newton was faced with the daunting task of coming to grips with the infinitesimal. Maybe this is what Blake had in mind in writing “If the doors of perception were cleansed, everything would appear to man as it is, infinite.” Arguably Blake’s most famous poetic lines about the infinite appear in his poem “Auguries of Innocence”:
“To see a World in a Grain of Sand, and a Heaven in a Wild Flower,
Hold Infinity in the palm of your hand, and Eternity in an hour...”**

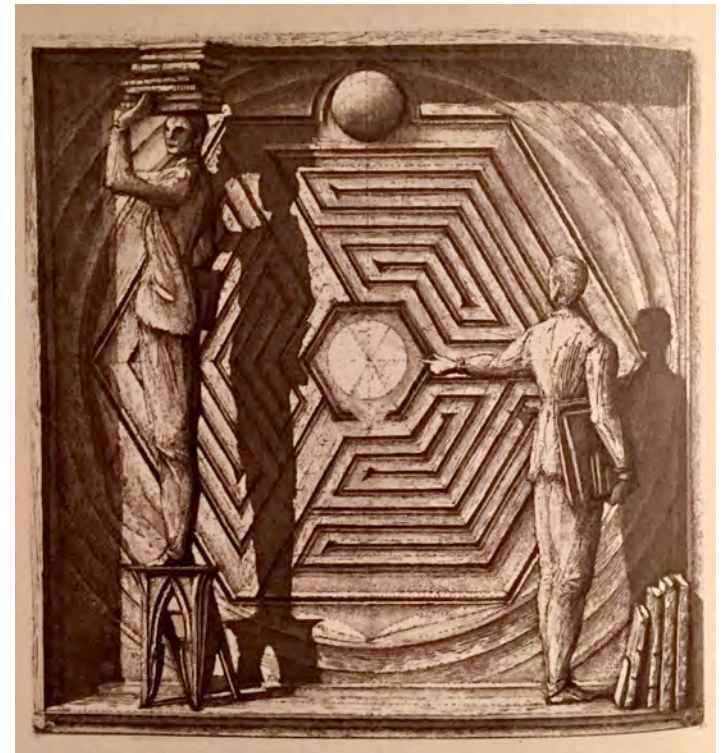
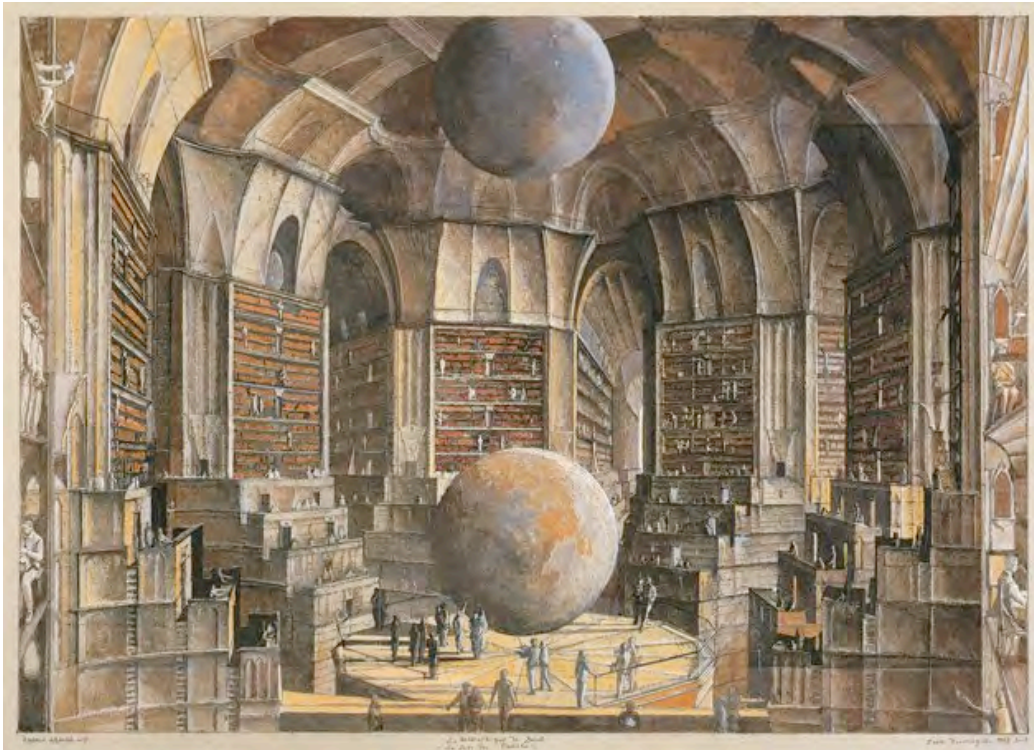
In 1970, American artist Richard Anuszkiewicz created ten serigraphic prints in response to ten of Blake's most suggestive poetic lines. These are contained in an elephantine artist's book, each print enveloped by a three-fold cover with the associated lines from Blake. The one shown here is Anuszkiewicz response to the Auguries verse.



*William Blake, "Newton", 1805 color print based on 1795 monotype (l);
Richard Anuszkiewicz, serigraph from the "Inward Eye" portfolio (r)*

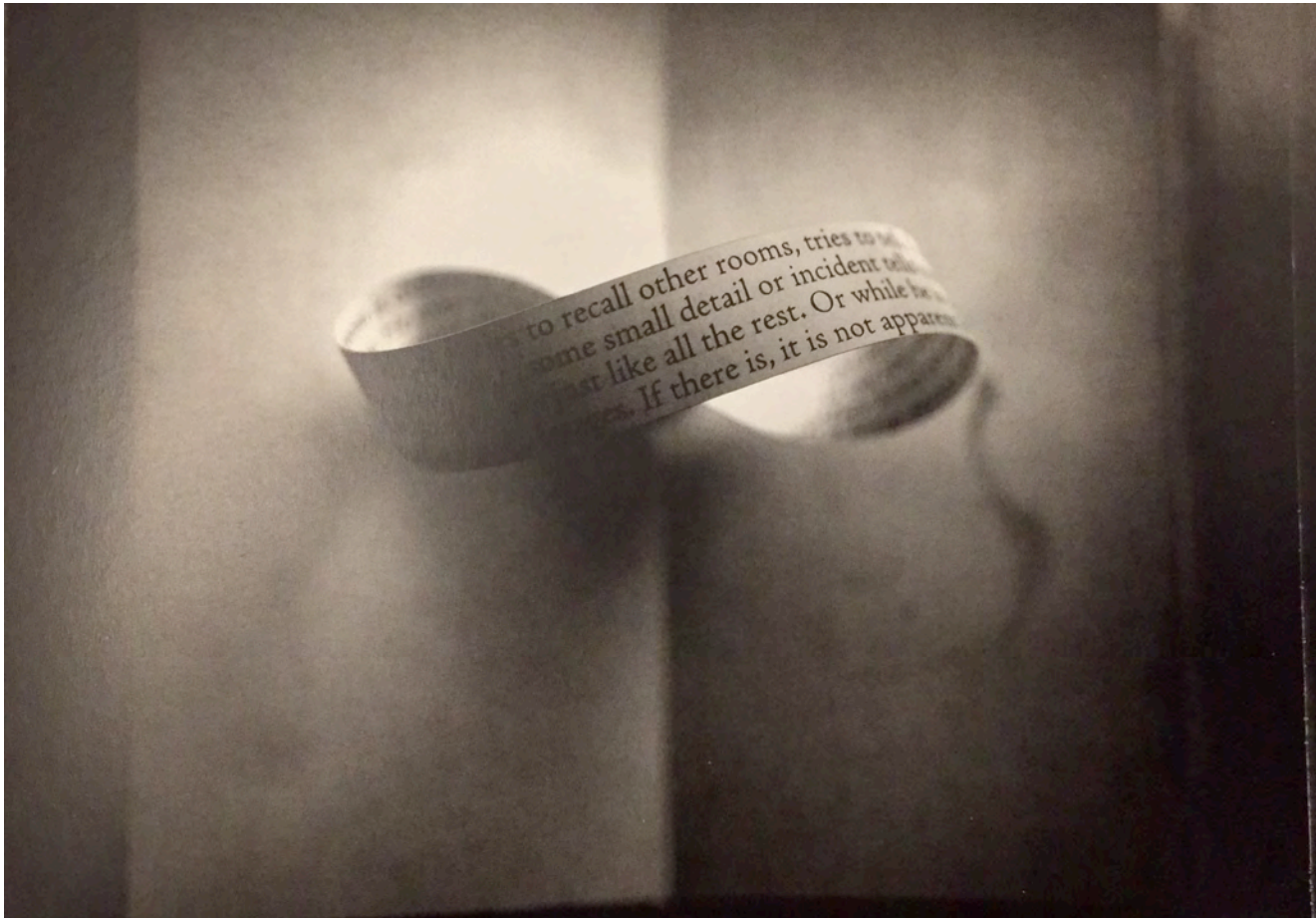
Borges' Infinities

“The Universe (which others call the Library) is composed of an indefinite, perhaps infinite number of hexagonal galleries.” So begins Jorge Luis Borges’ short story *The Library of Babel*. French master engraver Erik Desmazieres has reinterpreted the story visually by creating a suite of eleven large engravings for a wonderful portfolio.



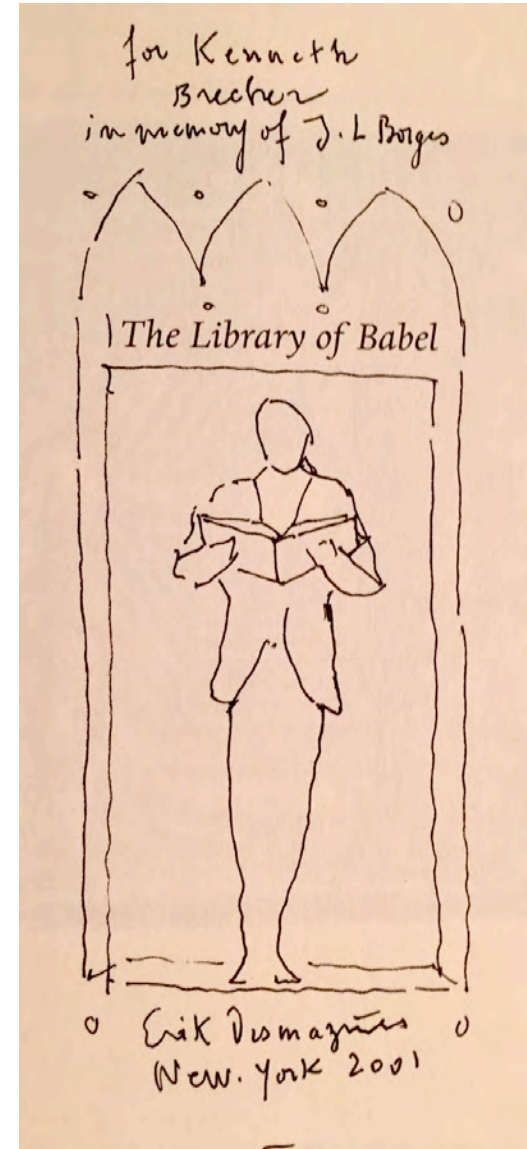
Erik Desmazieres, from “Library...”, copper plate engravings, 2000

American photographer Sean Kernan is both a master photographer and an author of books about and including his and others' photographic images. His book *The Secret Books* presents imaginative visual explorations of Borges' writings about the infinite - in particular about *The Library of Babel*.



Sean Kernan, photograph, 1999

I had the privilege to spend an evening with Borges in 1980. Part of our dialogue appears in the book “Conversations with Borges at 80.”



Borges and KB, Polaroid photo, 1980 (l); Sketch for KB, Desmazieres, 2001

Mathematicians' Eternal Flame

The sculpture below intertwines a Mobius band into a tetrahedron, with a Penrose Triangle in its base. Randy Rhine and I leave to others their own interpretations of our sculpture - for all eternity.



K. Brecher and R. Rhine, "Mathematicians' Eternal Flame", wood, 2015

Acknowledgments

I wish to thank Richard Zawitz for sharing his views about the artistic, scientific and philosophical nature of infinity; Gary Alison and Minori Yamazaki for sharing with me some of there mirror object design ideas; Charles O. Perry for some reflections on his mathematical sculptures; and Jorge Luis Borges for generously sharing with me some of his thoughts about time and the future.

And many thanks to Randy Rhine, my collaborator on several artistic/mathematical projects, including the sculptural projects presented here “Truncated Pseudosphere” and “Mathematicians’ Eternal Flame”.

Some Referee's Questions

Q. Haven't all of these artists been discussed at Bridges meetings before?

A. No. In fact, only a few of them have been.

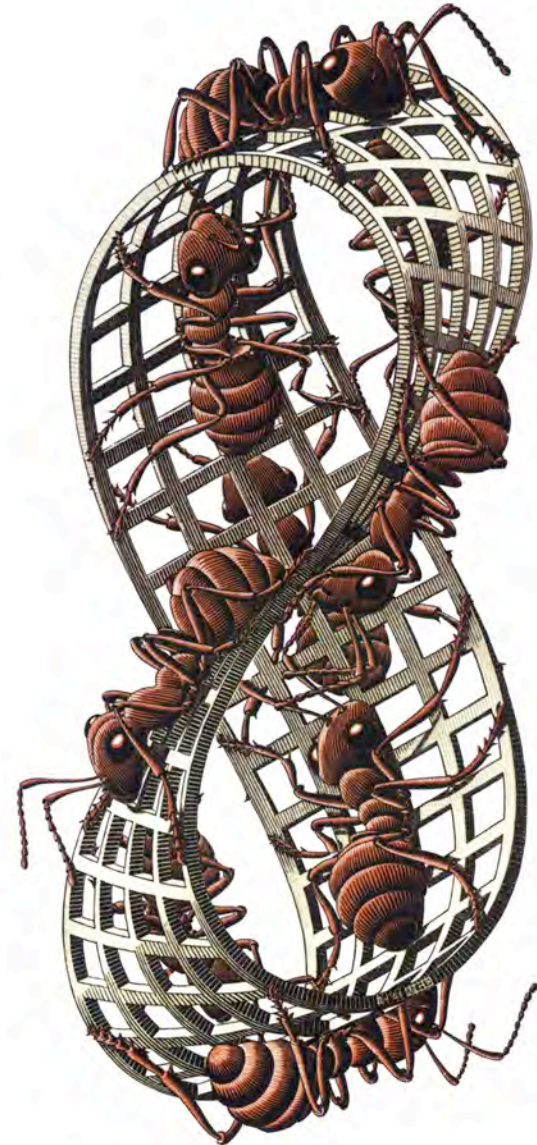
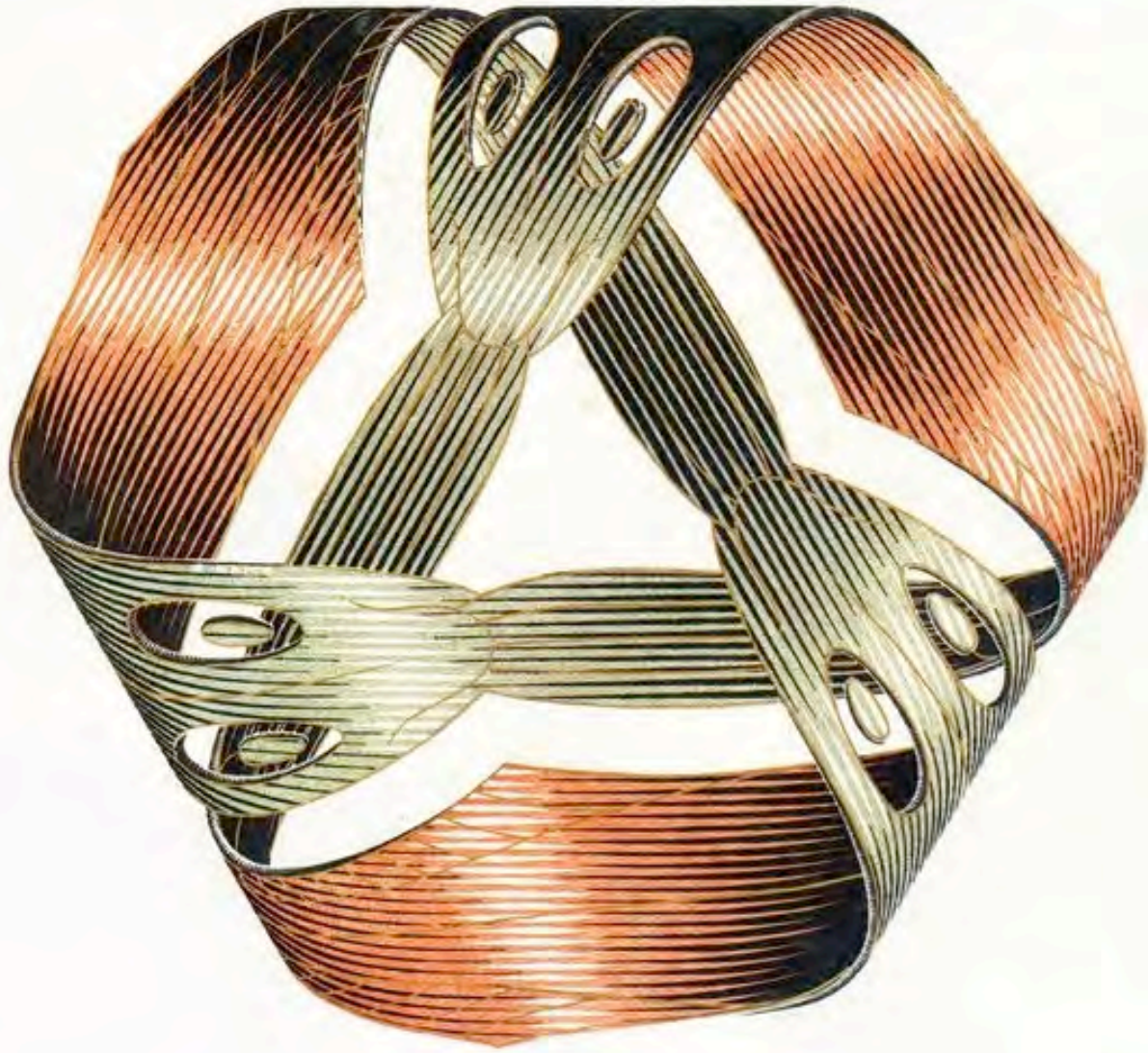
Q. Why did you include certain artists and not others?

A. Because their work interests me.

Q. What about Escher?

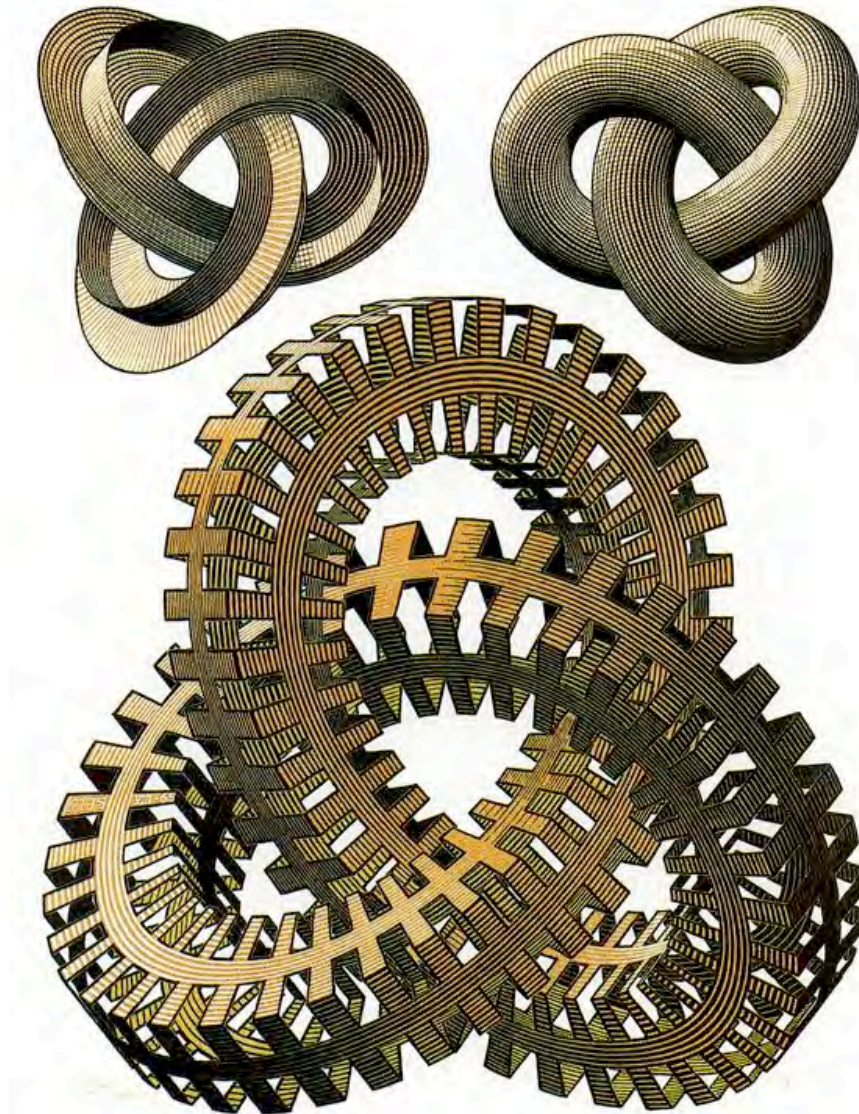
A. See below.

Escher and the Möbius Strip



M. C. Escher, “Möbius Strip I”, 1961(l), “Möbius Strip II”, 1963(r), woodcuts

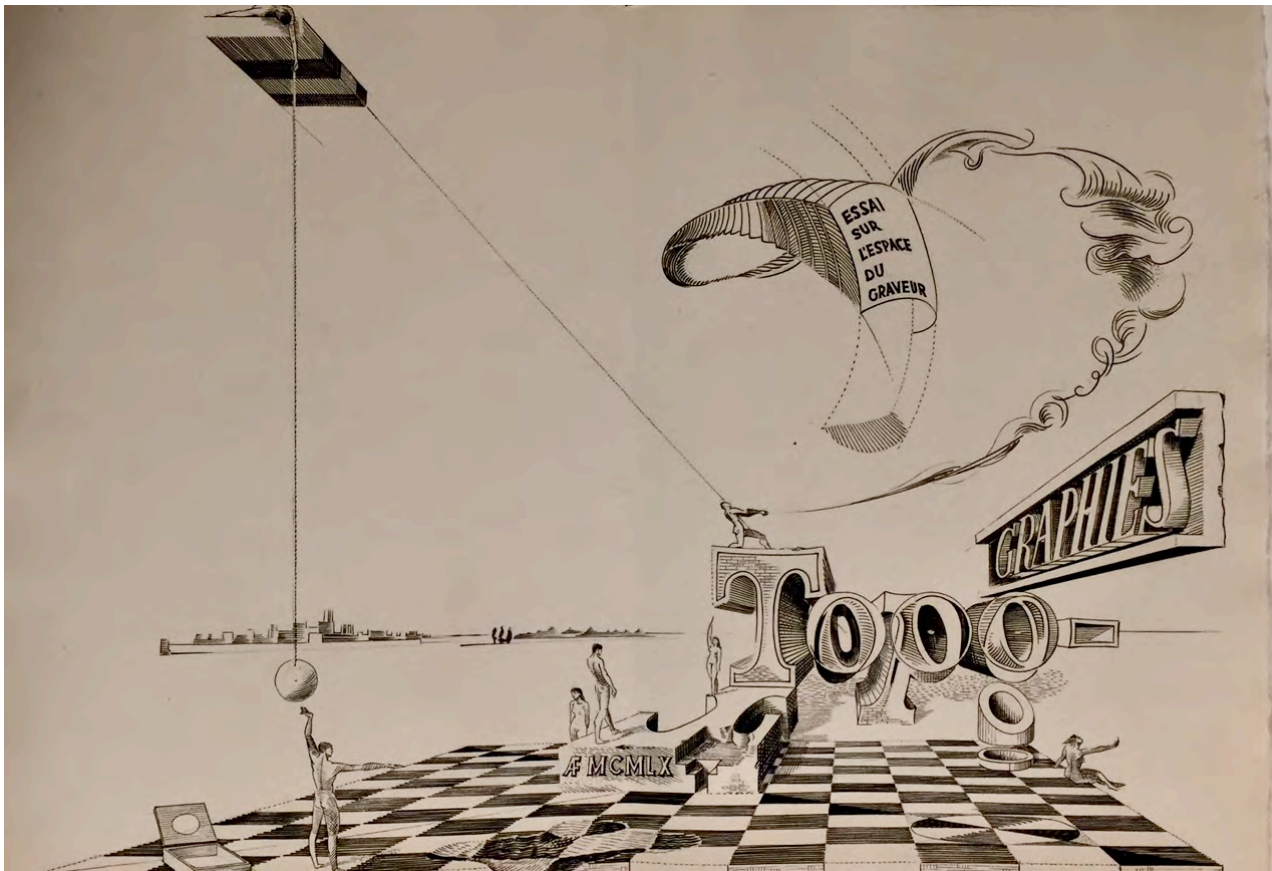
Escher and Knots



M. C. Escher, "Knots", woodcut, 1965

Albert Flocon

Albert Flocon (1909 – 1994) has been called the French Escher. They knew one another, and Flocon’s knot studies inspired those of Escher.



Albert Flocon, copper plate engravings from “Topo-graphies”, 1961

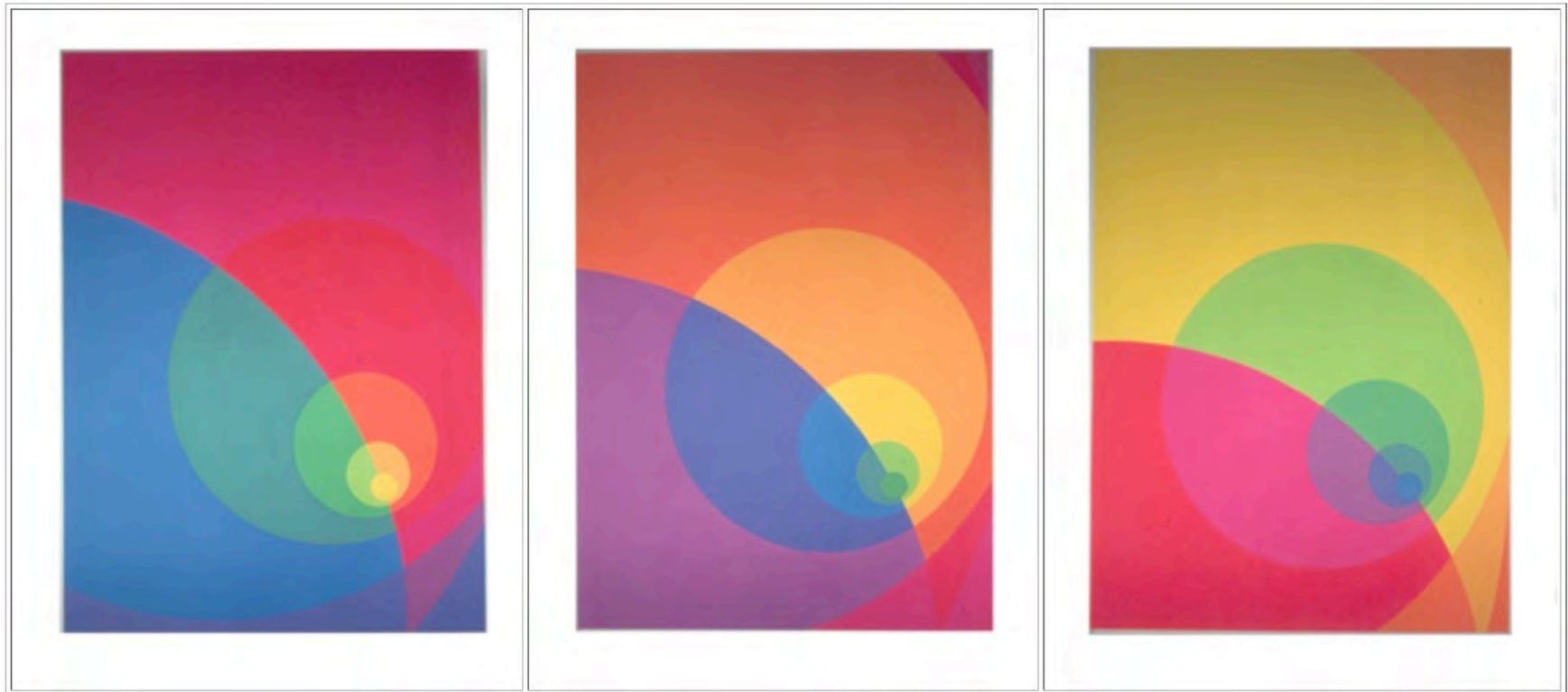
And Four More Infinities

Michael Alfano is an American sculptor who works in bronze and related materials. He has created his own three-dimensional language for expressing philosophical ideas.



Michael Alfano, "Infinite Mind", bronze, 2013

Herb Aach was an American painter, graphic artist and professor. He also translated Goethe's "Color Theory" from German into English. In the 1960's and 1970's he produced a series of paintings and serigraphs entitled "Split Infinity" using fluorescent paints and inks that he made. Three are shown below. He wrote: "The revolving axis, from surface to surface, dissects each. Since the essential movement is circular, meaning no end or beginning, it implies infinity."



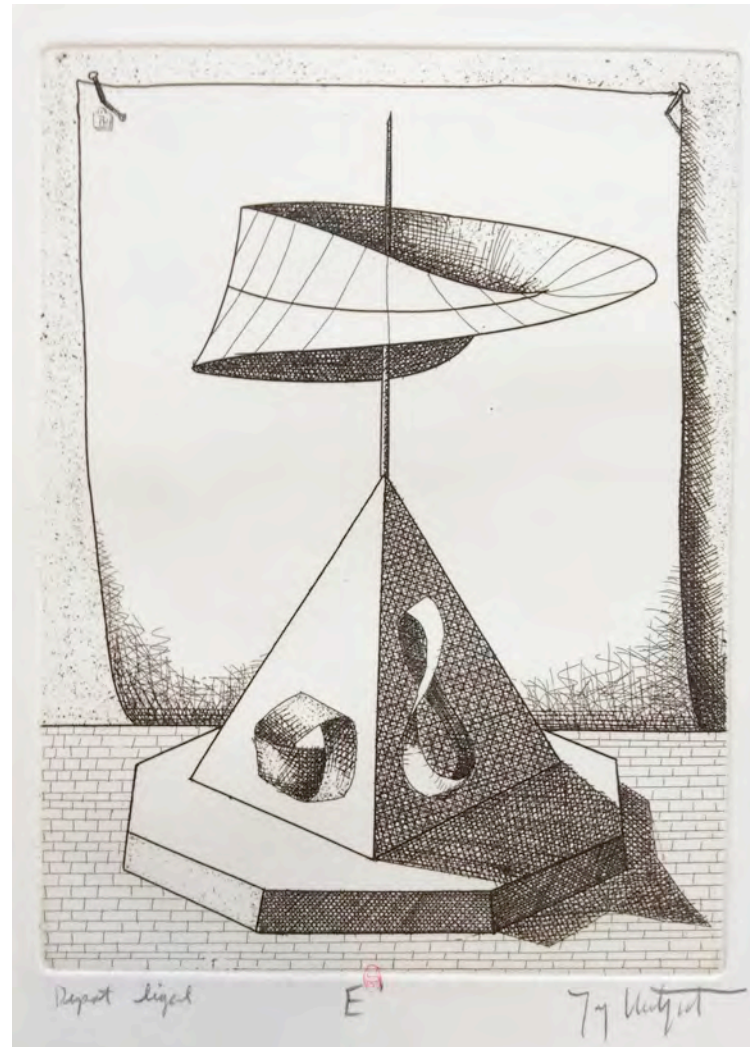
Herb Aach, "Split infinity" # 22, # 23 & # 25, each 74" x 54", acrylic on canvas, 1977

Jose de Rivera's large stainless steel sculpture "Infinity" was the first abstract sculpture ever commissioned by the U. S. Government. It is motorized, rotates in 8 minutes and sits near the mall in DC.



Jose de Rivera, "Infinity", stainless steel, 1967

Finally, French graphic artist Jorg Neizert has produced many engravings based on geometrical figures. The one below is an homage to Möbius (“This Quiet Roof Where Möbius Sleeps”).



Jorg Neizert, “Ce Toit Tranquille Ou Dort Möbius”, engraving, 1973